BELL TELEPHONE QUARTERLY

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AMERICAN TELEPHONE & TELEGRAPH CO.
NEW YORK

A Typical Private Branch Exchange Attendants' Training School. (*See page 231.*)

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A Medium of Suggestion and a Record of Progress

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An Important New Insulating Process for Cable Conductors

PULP insulation of wire conductors in telephone cables, to replace the familiar ribbon paper method that has been standard for 40 years, is one of the important recent accomplishments in the improvement of telephone apparatus and equipment. Its approval for Bell System use puts the pulp insulated wire process on a commercial production basis and marks the successful working out of the first phase of an interesting and rather spectacular development that has called for the closest co-operation between the various cable groups in the Bell System. Essentially, this development has brought the paper mill into the cable plant and combined it with the insulating process so as to eliminate some costly intermediate steps.

The pulp insulating machines are of a new type developed for the express purpose of applying pulp to wire and are something of a cross between wire handling and paper making equipment with numerous mechanisms especially designed for the job in question. Four of these machines are now in operation, two at the Hawthorne plant of the Western Electric Company and a like number at the Kearny plant with an output of approximately two hundred million conductor feet per week. The insulation itself consists of a continuous uniform sleeve of porous paper surrounding the wire but not adhering too tightly to it. The cables made from this material are of the new multiple unit type construction[1] the development of which came from the Laboratories at an opportune time to fit in with the pulp program and make its success more certain. They are of the same size as the older ribbon cables and possess similar though not identical physical and electrical characteristics.

[1] F. L. Rhodes, BELL TELEPHONE QUARTERLY, January, 1929, pp. 25–29. J. R. Shea, *Bell System Technical Journal*, July, 1931, pp. 443–445.

The operating characteristics of the pulp wire cables, once they are in service, are for all practical purposes identical with those of the older type.

It is interesting to look backward something over a decade at the background of this development. The whole telephone cable industry had been built up through some thirty years of development around high grade manila paper as an insulating material. Even under normal conditions the old rope market was feeling the strain put on it by the increasing demands for cable paper. Then came the War and the consequent restrictions on imports and it was only by the closest co-operation with the suppliers that the quality of cables was kept up during this period. In the years of high production immediately following the War the situation did not improve noticeably and it appeared to be a foregone conclusion that paper made from the vast supply of domestic wood pulp would ultimately have to take an important place as an insulation in American telephone cable practice. Experiments with the strongest wood pulp papers available at that time indicated that while the insulation was satisfactory from the standpoint of cable characteristics it was not economical to apply this paper by means of the insulators which had been developed to handle the tough manila paper. The problem was still further complicated by the growing demand for more wires in a standard sized cable. This condition could only be obtained by decreasing the conductor size and thickness of the insulation. Attempts to use a thinner paper were at once reflected in insulating troubles and progress on this problem was practically at a standstill. This was the situation which confronted the cable engineers of the System at that period and whenever they got together in their frequent informal conferences there was sure to be some discussion as to ways out of the predicament. The need was probably first clearly stated by F. W. Willard at a Western Electric Engineering Manufacturing Conference held at Chicago in 1919 when he called attention to the fact that no funda-

mental advances in the cable making art had been made since the introduction of lead presses and paper insulation, but that all progress had been confined to improvements in materials and equipment, and suggested the need of work along new lines. Work in the direction of adding refinements to the equipment for applying paper ribbon to conductors was being pushed vigorously, but this offered little hope of giving the final answer since any improvement in this affected the runnability of manila and wood pulp paper similarly.

It was during this period of uncertainty that some experiments in the development laboratories of the Western Electric Company at Hawthorne indicated the possibilities of simply and cheaply applying a coating of any paper pulp directly to the wire by a modified paper making process. A crude single wire machine was improvised and some test cables made up from hand picked samples. The mechanical and electrical results obtained from these cables were so promising that the management without hesitation authorized proceeding with the development of the equipment and product as rapidly as possible. At the same time the broad decision was made in joint conference with the General Staff Engineers that the stakes were sufficiently high to justify basing the development on the use of a sulphate wood pulp. Thus, at one stroke, methods, product, and raw materials were cut loose from all previous experience and the task of working out a complete, new and revolutionary process was taken up in earnest.

The fundamentals of the process were apparent, but the combining of them into a single production unit of commercial size, capable of making a product with the required characteristics, offered difficulties that required time, money, and the combined talent of all the cable groups in the System for their solution. For the sake of brevity the curtain will be drawn over the following years with their disappointments and thrills and raised again in the latter part of 1929 when one machine of the present type was operating at Hawthorne on a 50 wire

basis with the output going into 51 and 101 pair 24 gauge cables. The troubles were past, the idiosyncrasies that had threatened failure were ironed out and under control and the process was going smoothly twenty-four hours a day for six days a week. The outstanding developments which had made this possible were the electrolytic removal of residual drawing compound from the bare wire before it reached the pulp depositing mechanism so as to give a clean surface for contact with the pulp, the modification of the properties of the suspension of pulp in water by the addition of a small amount of soap to give a uniform sheet on the conductor, the ingenious mechanism for forming the sheet into a continuous somewhat loose sleeve around the conductor, which practically eliminated insulation breaks under normal conditions, and the drying of the insulation in a red hot furnace so rapidly as to minimize shrinkage and leave the insulation in a porous and concentric state as required for best results in cables.

During this development period the engineers of the Bell Telephone Laboratories and the American Telephone and Telegraph Company were struggling with the solution of their own particular problems in connection with the use of pulp insulation in cables, and it was not always smooth sailing for them, either, as is easily understood when it is remembered that the product with which they worked was something entirely new and still in process of development. However, the accomplishments of these years of struggle and uncertainty are best judged by a review of the advances shown in the art in 1929. At this time multiple unit type construction had become a fact in 26 gauge cable and almost a certainty for 24 gauge pulp cable, the proper sizes of insulated wire had been established, the capacitance was down to a reasonable figure, thanks to both cable design and improvement in the product, a good splicing technic had been worked out, certain pulp sources had been determined to be satisfactory for use in the product, the System was beginning to realize the advantages of the material and the program

for extending its use to all sizes of finer gauge cables was well under way.

The extension program has been carried out as planned, and early this year the standardization of all 24 and 26 gauge cables for manufacture from pulp wire was completed. This new type cable is being regularly supplied to the Operating Companies in large quantities and it compares favorably in all respects with the older ribbon type. It is a new product, but it is behaving very satisfactorily, and it can be confidently predicted that, as a background of experience is built up, further improvement in quality will be reflected in its performance.

The making of pulp insulation is a new art and a valuable one. It is not a finished art and it is still too young for all of its possibilities to be appreciated, but it is now established as a definite part of telephone cable manufacture, fully paying its own way and holding out the promise of substantial economies. It is gradually supplanting the ribbon insulating process for fine wire cables and, as soon as practicable, its possibilities as to coarser wire cables will be investigated.

H. G. WALKER

Preliminary Returns of the Distribution Census

BRIDGING the gulf between the farm and the factory on the one hand and the consumer on the other is the function of one of the largest divisions of American business, called Distribution. It comprises over a million and a half retail stores and about 170,000 wholesale establishments, requiring the services of more workers than any other single field of activity except agriculture and manufacturing, and representing an annual volume of business of over 100 billion dollars. It also includes the activities of over 17,000 hotels doing an annual business of well over a billion dollars.

In 1930, for the first time, the Bureau of the Census collected comprehensive reliable information regarding the volume, character and interrelationships of the vast network of distributive agencies engaged in the transfer of goods from producer to consumer. Although the preliminary returns contain certain imperfections, they provide a sufficiently accurate basis for the formation of some general conclusions regarding the quantitative aspects of distribution.

There has been much discussion in recent years regarding the increasing costs involved in the distributive processes. It is frequently claimed that the rising expense of distribution has largely offset the savings resulting from economies in production. The census figures have therefore been eagerly awaited not only by merchants, but also by manufacturers, bankers, economists and others interested in the problem of distribution, in the hope that a careful analysis of them will disclose methods of reducing the spread between the costs of primary production and the final selling prices of finished goods in retail markets. Not until now has it been possible to describe sta-

tistically the distributive machinery of the country with any degree of accuracy.

The telephone industry, too, has a direct interest in the census figures now becoming available; for these data may well prove exceedingly helpful in indicating ways whereby the movement of goods through the various distributive channels might be accomplished more economically and more efficiently by a more extensive utilization of existing communication facilities or even by the development of additional facilities or new types of service.

There are three fundamental steps in the movement of merchandise from producer to consumer: (1) manufacturer to wholesaler, (2) wholesaler to retailer, and (3) retailer to consumer. However, for present purposes, distribution may be divided into two main classifications—wholesale and retail, and these two divisions of trade will be discussed separately. The hotel business will be considered apart from the functions performed by wholesale and retail agencies.

The Wholesale Function

The annual volume of trade in the United States through all types of wholesale establishments approximates 70 billion dollars. This figure almost equals the gross value of manufactured products, is about six times the gross income from farm production, and exceeds the volume of retail business by nearly 20 billion dollars. The difference between the volume of wholesale trade and the volume of retail business is accounted for by the fact that the former includes exports made by wholesale establishments, and sales to industrial and dealer consumers, and also represents a certain amount of duplication due to the successive handling by several wholesale concerns of goods moved from producers to retailers and to industrial consumers through somewhat abnormal channels. Further inflation of the wholesale figures occurs where a wholesale trans-

action is later reflected in the cost of a manufactured product, as in the case of coal used for fuel in industry.

On the other hand, there are several channels of wholesale distribution which are not covered by the reported figures. While the volume of business shown in the above total includes sales by wholesalers to consumers at retail, it does not include the volume of wholesale business done by certain concerns which are primarily retailers. Neither does this total include the more than 11 billion dollars of sales made by manufacturers direct from their plants to retailers, such as to department stores, or the more than 16 billion dollars of sales made from manufacturing plants direct to industrial consumers, as when automobile parts are sold to an assembly plant. Furthermore, the wholesale figures omit direct transactions from producer to retailer, such as the farmer's deliveries of his products to the retail store.

The census figures show that the 170,000 wholesale establishments of all kinds in the United States have an average annual volume of business of over $400,000 per outlet. In addition to wholesale merchants of the usual type, these establishments include a secondary group performing wholesale functions and consisting of such types as brokers, commission merchants, manufacturers' agents and sale branches, importers and exporters, auction companies, bulk-tank stations, country buyers of farm products, and the like.

The extreme concentration of wholesale trade is convincingly shown by statistics for the group of 93 cities having over 100,000 population each. Although less than half the total number of wholesale establishments in the United States are located in these cities, which contain less than 30 per cent of the total population, these establishments account for over 70 per cent of the total wholesale business, or a volume practically equal to the entire retail sales in the whole country. The volume of wholesale business in these large cities is almost equally divided between regular wholesalers and all other channels of

wholesale distribution, although the former group accounts for two-thirds both of the establishments and of the employees.

The importance of wholesale trade as a population-building force can be readily appreciated when it is noted that 35 per cent of the total number of persons employed in all the distributive activities in these large cities are engaged in wholesale functions. In some cities, the employees engaged in wholesale trade constitute a sizeable proportion of the total number of gainfully employed, reaching as much as 10 per cent or more in such cities as St. Louis, Kansas City, Omaha, and San Francisco.

The Retail Function

The retailing of merchandise falls into several subdivisions. Some manufacturers dispose of their entire output solely through house-to-house salesmen, and mail order business is a potent factor in merchandising, especially to rural communities. But the retail store still holds the dominating position among the agencies serving the ultimate consumer.

From the trading post and general store, storekeeping has developed in several directions. The country general store is still an important factor in many of the smaller trading centers of the country, there being about 90,000 now in existence. In the larger communities, the department and variety stores constitute the modern development of this elementary type and they have increased in number until virtually every good-sized city contains at least one representative of this type of institution. The growth of the chain store is a phenomenon belonging chiefly to the current century; in fact, the most rapid growth of chain organizations has been in the past ten years. The backbone of our distribution system is, however, the independent retail store; as a class such stores handle more than 60 per cent of the total retail business of the country. Even in this classification, however, there are "voluntary chains" resulting from the association of several independent stores for group buying and for common merchandising poli-

cies, although no census figures are yet available that might indicate the extent of this development.

The 7,000 retail chains in the United States account for only 156,000 stores, or 10 per cent of the total number. In the food group of stores, the chains operate about 62,000 units; but this is only one-eighth of the total number of food stores. The same proportion applies to the automotive group of stores and filling stations, of which the chains have 32,000 out of a total of 253,000. This ratio is exceeded only in the apparel group where the chains with nearly 18,000 units have 15.7 per cent of the total number, and in the general merchandise group where 18 per cent of the stores are chain units. It is probably true, however, that, considering the average sales per store, the chain units as a whole do a considerably greater individual volume of business than do the independent stores.

The 1930 Census of Population brings out clearly the increasing concentration of population in urban communities and in suburban areas adjacent thereto. In fact, more than 40 per cent of our population is accessible in less than 2 per cent of the area of the United States. The fundamental changes in the growth and distribution of population seem to necessitate some revision in former methods of serving the consumer market. Furthermore, the influence of the automobile and good roads in facilitating travel have aided greatly in making the city store more accessible to the rural population. These factors have led mail order houses to supplement their regular business with retail outlets located in strategic positions. Department stores, through the establishment of branch stores, are utilizing a similar method of adaptation to changing market conditions.

The total volume of trade through retail stores, amounting to slightly more than 50 billion dollars per year, does not include strictly service businesses such as laundries, cleaners, barber shops, and the like, the total transactions of which are estimated to be between one and a half and two billion dollars. It does not include the sale of meals in hotel dining rooms nor

does it include a considerable volume of trade in supplies and equipment sold to business concerns for utilization rather than for resale, including such merchandise as hotel supplies, industrial and store supplies and equipment, and dentists' and physicians' supplies. In addition to sales through retail stores, there are direct sales at retail by planing mills, by milk producers, by bakeries, and by other manufacturers. There are also sales to ultimate consumers by wholesale establishments, offset in part by sales in wholesale quantities by one retailer to another retailer for resale. The aggregate volume of business transacted through all these non-retail channels might easily add 10 per cent to the total sales through retail stores. Furthermore, from the standpoint of total consumption of commodities, the retail figures do not give a complete picture since they do not cover cases in which the producer consumes his own product, as on the farm. However, the detailed figures for sales through retail stores are sufficiently inclusive to justify careful analysis.

The reported average retail sales per capita are $407.52, which would indicate retail purchases per family of from $1,600 to $1,700 annually. The annual per capita retail purchases in the several states vary greatly, ranging from as little as $172 in South Carolina to $575 in California and New York. The figures are generally low throughout the South and high in the Northeastern industrial belt (Illinois to New England) and the Pacific Coast states, with the farming region of the plains and Rocky Mountain states occupying an intermediate position.

The per capita sales through retail stores show an interesting relationship when compared with automobile registration, families with radios, and residence telephones per 100 population. It is not surprising to find that these ratios are usually high in regions where the per capita sales are greatest and correspondingly low in areas where the volume of individual trade is lowest.

The retail sales figures shown in the table on the next page

Region	Per Capita Sales	Passenger Car per 100 Population	Families with Radios per 100 Population	Residence Telephones per 100 Population
New England	$463.31	17.9	12.2*	13.4
Middle Atlantic	500.01	16.1	†	11.5
East North Central	452.28	22.0	12.1*	13.6
West North Central	408.46	24.2	10.8	15.4
South Atlantic	268.60	13.8	4.2	5.2
East South Central	220.51	10.8	2.8	4.7
West South Central	307.92	17.0	3.4*	6.7
Mountain	424.72	22.4	7.7	8.6
Pacific	549.53	29.7	11.8*	14.4
United States	407.52	18.8	7.9	10.8

* Data unavailable for California, Illinois, Massachusetts and Texas.
† Data unavailable for entire region.

provide only a very rough measure of relative purchasing power, for the reported retail sales in a state cannot accurately reflect the economic status of the resident population when outside influences enter to affect the totals. Among the several factors operating to distort the comparisons presented by the sales statistics by states, a few of the more serious ones include the business done by mail order houses outside the state of location, migration of consumers across state lines to reach big department stores, purchases by transients in foreign states, and the consumption by farmers of their own produce.

For the United States as a whole, the average annual sales per retail store are $32,297, but again there is a great variation among the several states. South Carolina is low at $19,827 per store, while at the other extreme is Michigan with the highest sales per store of $39,715. The census report also shows that the average population per store for the whole country is 79, or about 19 families, with the extremes ranging from as many as 124 in Alabama to as few as 66 in California, Delaware, Florida, New York, and Oregon. Of these states, however, only California and New York also show high sales per store.

GEOGRAPHICAL DISTRIBUTION OF RETAIL STORES AND UNIT SALES

Region	Number of Stores	Sales per Store	Sales per Capita	Population per Store
New England	108,187	$34,972.25	$463.31	75
Middle Atlantic	386,642	33,960.60	500.01	68
East North Central	318,814	35,887.13	452.28	79
West North Central	172,725	31,444.66	408.46	77
South Atlantic	169,393	25,042.96	268.60	93
East South Central	89,528	24,352.12	220.51	110
West South Central	136,193	27,531.13	307.92	89
Mountain	44,812	35,084.58	424.72	83
Pacific	122,874	36,647.76	549.53	67
United States	1,549,168	32,297.24	407.52	79

From the above table, it would seem that the per capita sales vary inversely with the population per store, the indicated purchasing power being lowest where the number of persons per store is greatest, and vice versa. This might appear to be contrary to the impression gained from counts made in connection with telephone surveys that the poorer sections of a community have relatively more stores than the good sections. However, an explanation can probably be found in the fact that in the more prosperous sections a greater proportion of the purchases belong in the luxury class and to a considerable extent are made, not in the local neighborhood, but in the downtown section of the same city, or in other communities.

A corresponding table for cities grouped according to population brings out the contrast between the per capita sales, or amount of retail business, in the cities of the country in comparison with the smaller places and the rural districts. In cities, a large proportion of the consumers' purchases take place through retail stores, while in the country many supplies are often obtained direct from the producer in wholesale quantities. Moreover, in large cities the retail stores serve more than the resident population, especially for purchases other than food and similar low cost staple commodities, whereas the rural stores are chiefly patronized only for the day-to-day re-

quirements, the people going to nearby sizeable cities for their luxury goods. Thus, it should be emphasized that the so-called per capita sales figure for a city constitutes a measure of the attraction of such city as a retail trading center rather than a measure of the buying power of its inhabitants.

RETAIL SALES DATA FOR CITIES BY POPULATION GROUPS

	Number of Stores	Sales per Capita	Sales pe Store
Cities of—			
Over 1,000,000	216,553	$628.95	$43,753
500,000 to 1,000,000	85,773	645.36	43,369
250,000 to 500,000	114,129	631.34	42,611
100,000 to 250,000	108,105	585.17	40,820
10,000 to 100,000	326,072	545.83	36,851
Balance of the United States	698,536	238.80	22,028
Total United States	1,549,168	$407.52	$32,297

It is interesting to compare retail expenditures by principal kinds of business and to see which group predominates in each division of the country. The table shown below indicates the relative importance of the principal retail groups for the country as a whole.

DISTRIBUTION OF RETAIL BUSINESS BY PRINCIPAL GROUPS

Group	Per Capita Sales	Per Cent of Total Sales	Per Cent of Total Stores
Food	$ 92.12	22.60	32.13
Automotive	77.76	19.08	16.35
General Merchandise	58.16	14.27	4.54
Apparel	35.15	8.62	7.29
Lumber and Building	29.62	7.27	5.15
Furniture and Household	18.62	4.57	2.87
Restaurants and Eating Places	17.08	4.19	8.76
Country General Stores	15.70	3.85	5 65
All Other Stores	63.31	15.55	17.26
Total All Groups	$407.52	100.00	100.00

The differential in per capita sales between the food and automotive groups is actually greater than appears from the

above table. On the one hand, the figure for the food group is low, since it does not include the products belonging in this classification sold through other outlets such as hotels, restaurants and eating places, general merchandise and country general stores. On the other hand, the figure for per capita sales in the automotive group is high in so far as motor vehicles are concerned, because sales of new automobiles are probably reported at full list prices without deducting the trade-in values allowed for used cars. Consequently, a certain amount of duplication is introduced in the sales figures when the old cars are resold.

The per capita expenditure for food products varies considerably, being low in food crop states and high in industrial regions. In some areas, notably farming sections, a large part of the food consumed does not appear in the retail trade and this explains why food sales are relatively low in such regions. For example, the people of the New England states buy a larger proportion of their retail purchases through food stores than is the case in any other part of the country. On the other hand, the proportion of the retail dollar which they spend through the automotive group is lower than for any other division of the country, except the Middle Atlantic Division, which is influenced by the very low automotive sales in New York City. The Middle Atlantic Division shows the highest apparel sales, however, of any section of the country, due largely to the influence of New York City. A further examination of the table on the next page shows the prominence of the country general store in certain sections, notably in the South Atlantic and South Central states. It shows how the country general store, which is a combination food and general merchandise store, affects the figures of the food group and of the "all other" group, which includes principally coal, drug, feed, and farm implement stores.

Although the census returns showing the volume of sales through stores of different types of operation are not yet com-

Geographical Distribution of Retail Sales by Principal Business Groups

(Expressed as a per cent of total sales)

Group	United States	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Food	22.61	26.56	25.96	23.34	17.67	21.87	19.04	18.10	19.64	20.82
Automotive	19.08	17.23	14.82	19.48	21.93	18.98	19.32	23.71	23.60	23.14
General Merchandise	14.27	13.19	13.19	14.11	13.86	17.14	17.40	15.81	15.33	13.45
Apparel	8.62	9.34	10.95	8.96	7.61	7.27	5.98	5.54	5.11	7.89
Lumber and Building	7.27	6.64	6.84	8.07	8.91	5.74	5.70	7.78	7.27	6.78
Furniture and Household	4.57	4.46	5.34	4.40	3.71	4.36	4.36	4.38	3.90	4.59
Restaurants and Eating Places	4.19	4.13	4.85	4.21	3.47	3.10	2.94	3.47	3.88	5.49
Country General Stores	3.85	1.56	1.81	2.07	5.77	7.76	12.56	7.79	5.99	2.06
All Other Stores	15.54	16.89	16.24	15.36	17.07	13.78	12.70	13.42	15.28	15.78
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

plete for the entire country, sufficient data are available to indicate the relative importance of the principal channels of retail distribution. A summary of the 957 city reports, covering all cities in the United States with a population of 10,000 and over, shows that 62.5 per cent of the retail business of those cities is done by single store independents, 19.2 per cent by local multi-units,* 15.3 per cent by sectional and national chains, and the remaining 3.0 per cent by miscellaneous other forms of operation. In comparison with this typical city situation, the preliminary returns for the 22 states west of the Mississippi River show that 69.5 per cent of the retail business of those states is done by single store independents, 16.4 per cent by local multi-units, 11.2 per cent by sectional and national chains, and the remaining 2.9 per cent by miscellaneous other forms of operation. These figures may help to dispel some current illusions regarding chain store systems, which are popularly credited with a disproportionately large share of the retail business.

The Hotel Census

The distribution census also includes significant statistics regarding the hotels in the United States, their number, geographical distribution, plan of operation (American or European), type of occupancy (transient or permanent), number of guest rooms, seating capacity of dining rooms, receipts, employees, salaries and wages paid, etc.

This hotel information is confined to hotels having 25 or more guest rooms. The number of hotels which reported is 15,577, of which 13,328 are hotels normally operating the entire year, and 2,249 are hotels of the resort type, operating from two to eight months of the year. The census did not include apartment houses, boarding houses, clubs, Y. M. C. A.'s and Y. W. C. A.'s, nor did it include 1,734 hotels from which it was

* The composite classification called "local multi-units" is made up of the following types of operation: 2 and 3 store independents, local branch systems (merchandised from a parent store), and local chains.

impossible to secure reports. It should be noted that restaurants and eating places not associated with hotels are included under retail stores, which were discussed in the preceding section.

The principal items of interest for all reporting hotels are given in the following table:

	Hotels Normally Operating Entire Year	Resort Hotels Operating Part of the Year
Total Number Reporting	13,328	2,249
Plan of Operation.		
European	10,907	370
American	1,097	1,537
Mixed	1,324	342
*Type of Occupancy.**		
Transient	4,941	646
Permanent	1,702	324
Mixed	6,685	1,279
Number of Guest Rooms	1,134,957	158,939
Seating Capacity of Dining Rooms	610,762	274,571
Total Receipts	$962,801,000	$76,562,000
Full-Time Employees	291,259	—
Salaries and Wages	$257,034,000	$15,814,000

* In determining the classification of a hotel as transient or permanent, 75 per cent of its patronage one way or the other is controlling.

The largest ten states, containing slightly over half the total population of the country, have 51 per cent of the hotels operating the entire year and account for two-thirds of the total receipts. However, the geographical distribution of the hotel business does not hold any uniform relationship to population. The number of hotels per 100,000 persons ranges from less than four in Mississippi and South Carolina to 44 in Washington and 62 in Nevada. These ratios have little significance though, in view of the fact that the controlling factor affecting hotel development is the volume of travel requiring hotel accommodation, since the great bulk of the hotel patronage is transient. However, it is helpful to know something about the

distribution of the hotel business, because the volume of general business in any city is affected somewhat by the incidental patronage of hotel guests.

In conclusion, it might be well to mention briefly certain other features of the distribution census which could not be included in the present summary because the returns are not yet available.

Later census reports will show the number of separate establishments which are operated by individuals, partnerships, corporations, or co-operative associations. They will indicate the length of time the establishments have been in business, as the rate of mortality among business concerns is a matter of real interest. Data have been collected regarding the number of employees, salaries and wages, expenses, amount of sales for cash and proportion of sales on credit, the relation of inventory to sales volume, the variety of stock carried, and many other items. Large retail stores have reported the amount of their returned goods and the part of their credit sales which is made on the installment plan. All important distributors were also asked to break down their total sales volume into the chief lines of goods sold.

Among the important data to be published when the tabulation of the census material is completed is information regarding the utilization of raw and semi-manufactured materials by the leading industries. Also, data on the sales channels through which specific types of manufacturers market their goods will later be available. Furthermore, this census will give comprehensive information for the first time about the distribution of so-called industrial goods, which are manufactured products the buyers of which are other manufacturers rather than ultimate consumers.

With the rise of nation-wide markets and with the increasing variety of consumer wants which has accompanied the improvement in the standards of living of the American people, distribution has become a highly important as well as highly

complex element in our economic life. The organization and methods of our merchandising machinery are already being studied and are being revamped to meet the changed conditions resulting from recent developments in production, in transportation, in communication and in living habits. The appearance of the data accumulated through the census of distribution should be of real assistance in directing this process of evolution along sound and efficient lines; for the census information will enable the substitution of facts for conjecture in the consideration of many aspects of the subject.

R. L. TOMBLEN

Some Bell System Services Offered to Private Switchboard Users

THERE are approximately 120,000 private branch exchanges connected with the Bell System which are operated by about 135,000 attendants. From these switchboards are placed nearly one-fifth of the eighty million originating calls handled each day in the telephone company central offices. In addition about eight million intercommunicating calls a day are originated at these branch exchanges. The telephone companies continuously study the many and various service needs of their private branch exchange customers, paying particular attention to the provision of adequate equipment designed to meet individual requirements as to appearance, type and capacities. The equipment varies all the way from the small cordless switchboard with three central office lines and seven stations to the largest dial installations designed to serve 480 central office lines and 9,600 stations. Every possible effort is made to develop and continuously provide the most satisfactory service at these switchboards both from a maintenance and operating standpoint.

The activities followed by the traffic departments of the telephone companies will illustrate some of the forms of service given to this large group of telephone users. These departments have organized small groups of employees in each of the larger cities whose time is effectively devoted to assisting private branch exchange attendants and their managements in solving their individual telephone service problems applying particularly to the operation of the switchboards.

It is estimated that private branch exchange operation provides employment for about 135,000 young women as attendants as compared to the 140,000 central office operators in the

Bell System. Realizing the difficulties encountered by private switchboard customers in securing well trained competent attendants, the private branch exchange departments of the telephone companies undertake to supply, without charge to either the customers or attendants, people who have taken a training course in private branch exchange operating. (*See frontispiece.*) Customers are also encouraged to send their present attendants to the telephone company's private branch exchange school for retraining when needed. Such services are popular as is evidenced by the fact that in 1929 the telephone companies supplied more than 25,000 attendants and in 1930, when requirements were probably less due to the subnormal business conditions, more than 15,000 attendants were provided. In addition about 7,000 attendants were retrained each year.

Many unusual requests are made by private branch exchange managements for attendants and the telephone companies have been quite successful in providing people who have special training or abilities. For example, a large bank whose business is largely with Spain and the South American countries required an attendant who could speak and write Spanish and who would also be able to translate Spanish correspondence into English. While no girls with these qualifications had applied to the telephone company for positions, an operator in one of the central offices was found who fully met the customer's requirements. Many requests are made for attendants who are able to operate a typewriter or do other office work and little difficulty is experienced in meeting such requests.

The success of the telephone companies in retraining attendants now employed has encouraged many large telephone users to take advantage of this service to retrain their entire force of attendants. In such retraining, the telephone companies give careful consideration to the personal desires and peculiar needs of the individual customers, as well as the nature of the work to be done, in order to make sure that the operating practices fit their requirements. For example, the New York Police De-

partment employ about 450 patrolmen and sergeants to operate their switchboards on a 24-hour basis. The Police Commissioner made arrangements with the telephone company for the training of their entire operating force and this work was completed during 1930. In the Police College which trains new patrolmen, a course in private branch exchange operating as suggested by the New York Telephone Company is now one of the important subjects.

Every effort is made by the telephone companies to keep subscribers, attendants and other employees well informed of the desirable feature of good telephone service in their establishments and of the large and important part this service performs in the conduct of their business. The attendants who handle incoming calls for their patrons speedily and helpfully register a first impression of the character of the business house which is of great value in placing the telephone caller in a pleasant frame of mind and avoids the antagonism which is often created through indifferent service. The station-users may further establish this impression of a well run business organization through promptly answering the telephone and subsequent courteous treatment of those who call them.

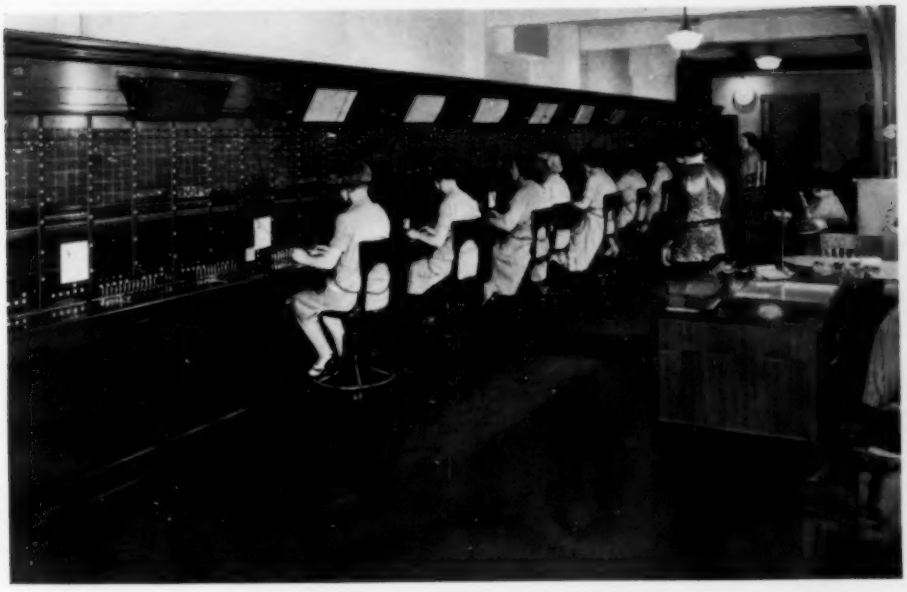
The private branch exchange organization in the traffic departments of the telephone companies is made up largely of two groups of instructors. One group devotes practically all of its time to the training of new attendants or the retraining of existing attendants on the telephone company premises. The second group consists of visiting representatives who spend most of their time on the continuous instruction of attendants on the customer's premises. These instructors, who are carefully selected from the central office supervisory forces, are given such special training in various phases of the telephone business as is adapted to qualify them to meet the private switchboard attendants and their employers. The visiting representatives of the telephone companies are often of assistance during times of emergency. For example, one of the visiting

instructors in a large city was on her way to work one morning when she noticed an excited crowd pushing its way into a local bank. Her inquiries brought out that a run on the bank was in progress. Knowing what was probably involved she called upon the president of the bank and offered to help with the telephone service. All that day and the following morning she relieved the bank operators of the extra heavy load and dealt with an excited clientele tactfully and efficiently. She kept in touch with the bank for the next few days in case help should be needed again. Her good judgment and usefulness is an example of the high service ideals instilled in her by the telephone company.

The larger private switchboards often present equipment and operating problems which require considerable individual study to make sure that the telephone service given fully meets the needs of the establishments. To illustrate, the larger hotels have a number of operating problems in connection with the giving of satisfactory telephone service to their guests. As most of the patrons of these hotels are transients, up-to-date information records must be available to the attendants. Furthermore, prompt transmittal of local and toll charges must be made to the cashier so that they will appear on the guest's bill when he checks out. Calls are often handled by the attendants which require paging of guests, and this involves special handling due to the delays in completion. Hotel attendants, therefore, must be particularly well trained, and the telephone companies have given special assistance in this respect.

The larger department stores with their many departments, order-taking units and heavy traffic loads due to advertised sales, offer problems which the telephone companies are continually studying. These studies are designed to make sure that the volume of traffic passing through the department store switchboards is handled with dispatch and without delay due to either equipment or operating difficulties. Many of these stores have developed a big telephone order business, not only

A One-Position Cord Board Installation.



A Large Hotel Private Branch Exchange.

from patrons in the cities in which they are located, but also from suburban areas. It is often necessary to develop special toll practices and equipment arrangements to handle the large amount of traffic involved.

In a number of cases the telephone companies have taken over the continuous supervision of the work of attendants in order that special study may be given to the individual telephone service requirements of the establishments and to see that the attendants are properly trained in the operating methods found most practical. Gratifying operating improvements have been promptly made and the private branch exchange managements have shown appreciation for the improvement in service which has thus been brought about. A number of hotels, department stores, banks and other business establishments are now receiving this service.

While the problems encountered in connection with equipment arrangements and operating practices for the larger switchboards require special attention by the telephone companies, a large amount of time is also devoted to assisting customers who operate switchboards of one or two positions in meeting their telephone service needs. Over 95 per cent of all private boards are of one and two positions and necessarily most of the time of the telephone company private branch exchange organizations is devoted to the assistance of these telephone users in meeting their problems.

As a large proportion of all toll and long distance business originates or terminates in private branch exchanges, considerable study and aid has been given by the telephone companies to the development of methods to make this service the most useful to these telephone users. Extension users are encouraged to place their toll and long distance calls directly with the toll or long distance operator and to remain on the line until the called station answers or until a report is given by the operator. Where this is not feasible, it is generally suggested that the call be placed by the private switchboard attendant

who requests the extension user to wait on the line until the called party answers or a definite report is received. With this arrangement, the service has proved to be much faster than when the extension user hangs up the receiver after giving the details of the call to the private switchboard attendant. Under the latter condition delays are often encountered in reaching the party who put in the call. He may have left the telephone or have made or received another call in the meantime. This results in annoyance to the called party, who is brought to his telephone several times unnecessarily, only to find that the person who placed the call is unable to talk. Delays are also avoided by encouraging the user or private switchboard attendant to give the called number and, in many cases, where the volume of long distance traffic warrants it, the telephone companies have found it desirable to supply lists of frequently called out-of-town numbers. If the amount of such business is exceptionally great, lines are provided in some cases directly from the private branch exchange to the long distance switchboard in order that calls may be routed to the long distance operator without passing through the local system.

There is no doubt that private branch exchange users are showing increasing appreciation of the important part good telephone service plays in the conduct of their business and are consequently giving full co-operation to the telephone company representatives in effecting improvements. The business man is generally alert to the fact that a good first impression of his establishment is of considerable value and that this first impression is often made by the private switchboard attendant who answers incoming telephone calls.

G. L. WHITEMAN

Buried Cable Distribution System

TAPE armored cable was first installed in the exchange plant of the Bell System in the latter part of 1929. The first installations were made on a very limited, experimental basis, but proved so satisfactory that the use of such cable has increased at a surprisingly rapid rate. During the year 1930 over two hundred thousand feet of cable of this type was installed, while judging from the experience to date, it seems likely that from three to four times that amount will go into plant during the current year.

Before describing this new cable system and the conditions under which its application to Bell System needs appears to warrant such rapidly increasing utilization, it will perhaps be helpful to review briefly the development of the situation that has brought this type of plant into being.

One of the very noticeable trends in community life in this country during recent years has been a growing sense of æsthetic values. This has been particularly in evidence in the case of residential developments where more and more attention has been given not only to building houses of distinctive and attractive appearance, but also to the landscaping of the surrounding grounds, the planting of shade trees along the highways, the installation of ornamental lighting systems, and to many other details designed to contribute to more pleasant living conditions.

This tendency is a natural accompaniment of our country's progress from the pioneer state where almost all man's energies were required to gain the bare necessities of life. The industrial era of today, however, brings a greater share of the leisure time that affords opportunity for appreciation of the beautiful and encourages our people to develop it. Perhaps, too, the urban conditions in which a constantly increasing proportion of

our population finds itself have played their part in that urge toward pleasanter home surroundings which has found expression in the attractive suburban residential communities contiguous to practically all the larger cities.

It is peculiarly appropriate that modern industry, having contributed largely to promoting the desire for the æsthetic, has supplied in substantial measure the materials and facilities for its realization. The availability of telephone service has, of course, been an important factor in rendering suburban residence convenient and even possible. However, the provision of plant to furnish this service has in itself created a problem in that plant of the type that originally seemed economically most appropriate to such communities did not appear to harmonize with the general appearance of the surroundings.

Fortunately, fairly early in the period that marked the trend toward suburban residence, lead covered cable, for economic reasons, supplanted open wire for exchange distribution, except where only a very few lines were involved. Such cables, although carried on poles, presented a neater appearance than plant of the open wire type and, in addition, yielded certain maintenance advantages, not only in their greater freedom from sleet storm damage, but in avoiding the impaired insulation to which open wires were subject where they passed through the trees that were being planted in ever increasing numbers along the highways and residential streets.

The use of aerial cable in place of the open wire that had previously lined the streets was a distinct advance from the standpoint of appearance. But it was not felt to be completely satisfactory from this point of view, particularly in those localities where greater and greater emphasis was being placed upon the beauty of the surroundings. In some places the poles were painted green in order that they might harmonize with the foliage of the shade trees and thus be less conspicuous. As a further step, underground connections between poles and houses were made available to those subscrib-

ers who were willing to share the additional cost of this type of plant.

A very definite advance from the appearance standpoint was made through use of poles jointly with the electric light and power companies. This resulted in a reduction by one-half in the number of poles that had previously been required by the two utilities.

Despite the adoption of measures to improve the appearance of the aerial plant along highways, it was recognized that in communities where matters of civic beauty were being stressed, the presence of pole lines on the streets would frequently not continue to be appropriate and the interior block aerial cable system was accordingly devised. This consisted in transferring the pole line and its cable to a location along the rear property line throughout the block. The highways were thus relieved of unsightly plant, and for a time this seemed a reasonably satisfactory ultimate solution of the problem of reconciling the presence of telephone plant of an economical type with the appearance of the surroundings.

The demands of æstheticism had not been completely satisfied, however, and were expressed increasingly in the landscaping of the grounds surrounding these suburban residences, with the result that pole lines in the rear of the residences no longer seemed altogether appropriate. It became evident that there could be but one entirely satisfactory alternative, namely, to place the plant underground. This conception was, of course, by no means new, as underground plant had, in fact, been employed for residential distribution in a large number of instances, but the cost of such plant imposed severe limitations upon its use. The underground system available consisted of cables, conduit and manholes and, due to its very much greater cost than that of aerial plant, could be installed only where the subscribers directly benefited were willing to assume a substantial portion of its cost. It was apparent that if, as seemed desirable to conform to the popular trend, the use of under-

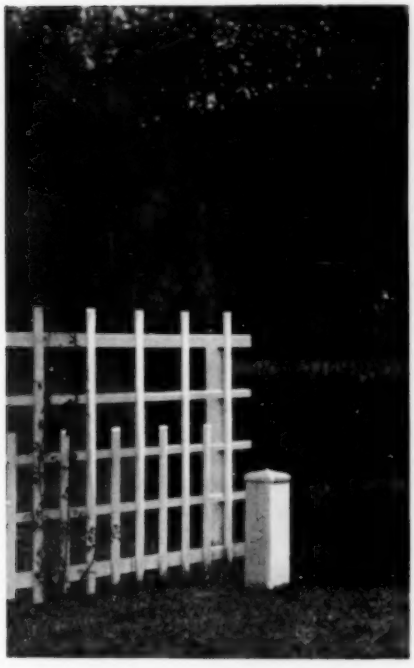
ground distribution were to be extended, a less expensive type would have to be found.

As in the case of the toll cable plant, the need of a lower cost underground system suggested the use of tape armored cable, buried in the ground without conduit. Such cables have been used satisfactorily for many years in various European cities, and while some of the conditions of service in this country are different, it was considered feasible to design a distribution system employing tape armored cable that would be adequate to our needs.

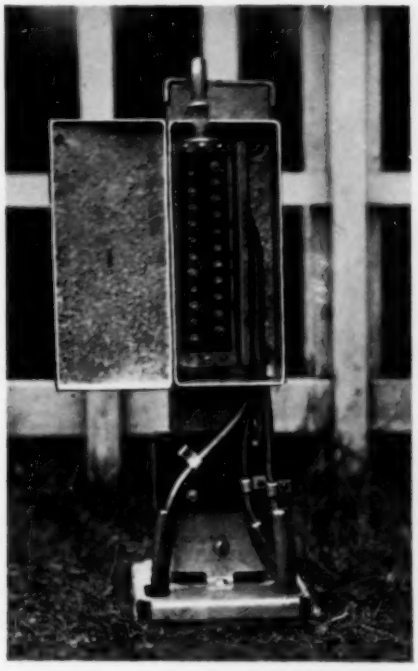
Normally, a tape armored cable is installed to care for the distribution within a single block, or a succession of blocks, this cable being fed by underground cable in conduit. To avoid the expense of a cable splicing operation each time a subscriber's connection is made, terminals are installed as in the case of aerial cable. The aerial cable terminal is, however, unsuited to use underground, and it was therefore necessary to devise a terminal for such use, a primary requisite being that the terminal be water-tight. This was accomplished by using a cast iron housing, the cover being equipped with a rubber gasket and clamped in place by means of wing nuts. Special fittings were needed to make water-tight the entrances of the small one and two pair cables employed to serve the individual residences. As the terminal must be accessible, it is usually installed in a small concrete box in which is also placed the splice between the terminal stub and the distribution cable. A removable steel cover is provided for the concrete box.

Terminals, in addition to providing the connection between the distribution and subscriber's cables, serve as testing points in locating cable failures. An underground terminal is not, therefore, sufficiently accessible in localities where snow and ice cover the ground throughout a substantial part of the winter months. To meet this condition, a terminal mounted on a pedestal has been designed. A metal housing serves to shelter the terminal and cables, and at the same time affords a sightly

Underground Terminal—Cover Open.



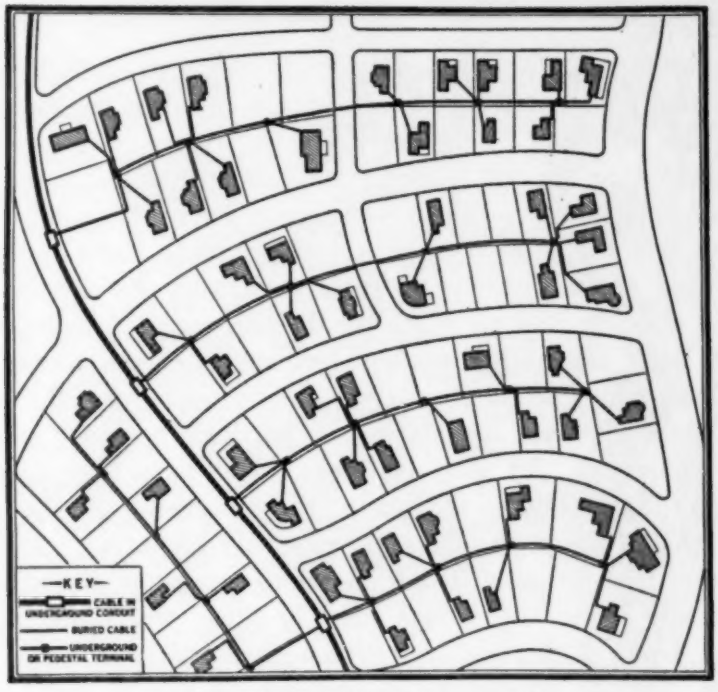
Pedestal Terminal on Rear Property Line—Housing in Place.



Pedestal Terminal—Door Open.

appearance. As the housing is only approximately seven inches square and about two feet high, it is reasonably inconspicuous.

Since the recovery of buried cable is of doubtful economy, it necessarily follows that such plant should be installed only where it will care for the requirements of the situation throughout a long period. Interior block cables can, as a rule, be de-



PLAN OF BURIED CABLE DISTRIBUTION.

signed to care adequately for long period service and, coupled with the ease of conducting installation activities under lawns, the location of the cable along rear property lines seems to offer the most attractive field for the use of buried cable in the exchange plant. There are, however, other applications of this new type of plant that have promising possibilities.

In towns where the telephone development is very slow and where the presence of a heavy growth of trees along highways

would render the erection of aerial plant both expensive and undesirable, buried cables are being used for feeder purposes, such cables being installed either along the edge of the highway where they are unlikely to be covered by paving or through alleys, where the latter exist. In some instances the desirability of such construction may result from the necessity of avoiding conflicts with power lines or from considerations of economy.

Limited use will doubtless be made of buried cable for distribution purposes along streets, usually between the roadway and the sidewalk. This location is in general, however, less desirable than the rear property line, inasmuch as it is necessary either to place a cable along each side of the roadway, with the result that the cable footage is doubled, or to make frequent crossings of the roadway to reach houses on the side of the street opposite that on which the distribution cable is located. This latter alternative involves frequent openings across the roadway which are in themselves objectionable from the public's standpoint and also expensive, particularly where paving is encountered. In some instances, pipes have been pushed across the street under the paving, to avoid disturbing the road surface, but this is an inherently expensive operation. It thus appears that buried distribution cables can be employed economically along the streets only in those situations where right-of-way difficulties or frequent obstructions, such as garages, preclude placing the cable along the rear property line.

Compared to cable in conduit, tape armored cable is less expensive from the standpoints of both materials and installation. A factor in the latter consists in the possibility of making abrupt deviations in the line of the trench to avoid obstructions such as boulders and trees, whereas in laying conduit these irregularities in alignment must be limited in order that the cable can be pulled into the conduit.

Compared to aerial cable with overhead drop wires, the buried cable system is in general inherently more expensive.

There are, however, exceptions to this rule, particularly where the soil conditions are favorable to excavating operations. In some cases residential areas are laid out with winding, tortuous property lines that render the cost of pole line construction high, because of the many guys and anchors required. Under these conditions the cost of the buried distribution cable, in place, is likely to be less than that of an aerial cable and pole line.

Efforts are continuing in the direction of effecting further economies in the manufacture and installation of buried cable, and it is possible that in time costs can be reduced to a point where, under average conditions, buried distribution cable costs will be more closely in line with those of aerial cable and pole line. It seems questionable, however, whether the buried one or two pair cables used to make the connections between the distribution cable and the subscribers' houses, can be brought down to the cost level of overhead drop wires.

In conclusion it should perhaps be stated that the buried distribution plant has been adopted to meet new conditions for which aerial cable does not seem suitable and cable in conduit is too expensive. It does not contemplate the abandonment of pole line plant since the latter will, of course, continue to be appropriate under many of the conditions actually encountered. Rather, the effort is and should be directed to having available a plant system that, from the appearance standpoint, will be harmonious with the ideals of the community as evidenced by the erection of buildings of attractive design and the attention devoted to beautifying the environs. By effecting further economies in the buried cable system, it is the hope that the Bell System may constantly increase its contribution to the æsthetic achievement of the community, no matter how modestly the latter may be carried out, without sacrifice of sound economic procedure.

C. G. SINCLAIR, JR.

The Beginnings of Long Distance

AT the Annual Meeting of the Stockholders of the American Telephone and Telegraph Company in March, 1931, it was voted that the corporate existence of the Company "be extended beyond the time specified in its certificate of incorporation, so that its duration shall be perpetual."

In the original certificate of incorporation, filed in 1885, the life of the Company was limited to fifty years. The stated object of the Company was to develop nation-wide and international telephony, and this was a very imaginative objective considering the state of the art at that time.

In sharp contrast with the telephone's usefulness today, which includes radio, telephotography, teletypewriter, and transoceanic service, are the conditions of those early days when it was necessary to experiment in order to ascertain the best methods and the right road to success. The formation of the American Company in 1885 was the beginning of a new era in communications, and there was little or nothing at hand to point the way. Vision and courage were necessary.

When the commercial work of the telephone began in May, 1877, the "subscriber" simply rented two instruments. He located them where he pleased and he connected them with an iron wire himself. But so much trouble resulted from improper installing that both parties welcomed the amendment when provision was made in the contracts that the line should be furnished by the Telephone Company. Local commercial development was initiated and superintended by agents licensed by the Bell Telephone Company in Boston. These agents raised the necessary money locally. This was the first, the Private Line period of telephone history. It drew to a close in 1878. A convenient date to mark the approach of the Exchange period

is the opening of the first regular commercial exchange at New Haven, Connecticut, on January 28, 1878.

From these individual agents local telephone companies grew up. Soon telephone subscribers became numerous enough to be class conscious. The desire sprang up among them to talk to each other. This desire started experimenting. Each license agent worked out his own device for connecting his subscribers to each other. Gradually, through consultation with Thomas A. Watson of the Bell Telephone Company in Boston (the only one there was at first to consult); through conferences with each other; and improvements resulting from experience, the telephone switchboard and the central office developed and opened up new fields of practical use and of commercial value to the telephone. Soon it was forgotten there had ever been a time when telephone service had consisted entirely of private lines without any interconnection or exchange service. The inherent possibilities had led the way, and successful experiment had cleared the path. This was the second period of telephone development. It was made possible by Technical Engineering and may be called the Local Service or Exchange Period.

As the types of switchboard tended toward a standard, so too by natural extensions and mergings the numerous license agencies and local Telephone Companies first increased rapidly in number and then gathered together a smaller number of larger companies, pointing toward what are now the operating or Associated Companies of the Bell System. In exactly the same way that telephone subscribers developed inevitably a desire to talk with each other, different towns and cities (which at first usually meant different Telephone Companies), wished to be able to talk with each other. The steady improvement of telephone apparatus rendered this no vain wish, but promised that before long it would be technically possible.

But who should attempt it? Would telephone service over these longer distances pay? How should the lines and opera-

tion of this new intercity service be distinguished from the local telephone service? Or should the two be managed together in some way? In the case of Companies whose territory was adjacent it might be simple enough: let each Company contribute the construction and maintain the operation in its own territory. But when there was an intervening territory belonging to one or more other Companies, would it be feasible to expect these uninterested Companies to meet expense for the benefit of the distant Companies? Again, would they consent to having their territory invaded by outside Companies? On the other hand, would the outside Companies care to finance construction and operation in territory they did not control? The whole situation made up a complicated problem, but one that in the pressure of the march of events had to be met, had to be solved.

It was most fortunate that at the head of the telephone industry at that time stood a group of men of the right character to make the most of the situation and its possibilities. At their head was William H. Forbes, President of the National Bell Telephone Company from March, 1879, and of its successor, the American Bell Telephone Company, an executive of decisive influence, who knew men and was remarkable for getting results from and through them. The Board of Directors comprised men like Charles P. Bowditch, Alexander Cochrane, Francis Blake, George L. Bradley, and William G. Saltonstall, —men of standing and ability. Working hand in hand with Mr. Forbes was the General Manager, Theodore N. Vail, a man of initiative and of vision, and of rugged determination. Seen from the standpoint of the present, the problem was one of the original creation of a new Long Lines system. From the standpoint of the time, however, the problem appeared to be one of correlating the existing telephone exchanges, a problem of management. It naturally fell then primarily into the province of the General Manager, and Vail was a creative genius in business organization.

The third period of telephone development was thus introduced by Mr. Vail's decision to try to create what he called, with a use of the word common at that time, a *grand* system, or as we would now be more likely to express it, a universal system. It was a masterly piece of Commercial Engineering, as has been demonstrated increasingly ever since with the growth of the country.

So Vail with the support of Mr. Forbes and the Board of Directors put through the first long distance experiment, the Boston-New York Telephone Line. While the engineers were improving the apparatus so that it could be relied upon to give good transmission and justify commercial operation, he attacked the problem from the organic and financial side.

In a Boston-New York telephone line at least four, maybe five, distinct Companies would be concerned. There was first in Massachusetts the Telephone Despatch Company in Boston; and then the Southern Massachusetts Telephone Company, in process of consolidation with other local companies; in Rhode Island there was the Providence Telephone Company; in Connecticut there was the Connecticut Telephone Company; and at Greenwich the line would pass into the territory of the Metropolitan Telephone and Telegraph Company of New York.

Mr. Vail suggested that the long distance line be constructed by the parent company, the American Bell Telephone Company, separately from all local lines. The idea was approved on June 2, 1880. Almost immediately however it was decided to go more slowly, to feel the way, to start building the through line only from Boston to Providence. In case of failure the local companies could take over their own sections of the line. But Mr. Vail put through his point that the line should not be built by those local companies, but by a new, a separate company. Accordingly, on July 7, 1880, the Inter-State Telephone Company was incorporated in New York (the objective point he had in mind) for the purpose of building and operat-

ing this line, under a license from the American Bell Telephone Company. It built it. The line was opened for commercial operation on January 10, 1881.

The next section, extending westward from Providence, would carry the line into the Connecticut Telephone Company. The New Haven officials became enthusiastically interested. Most of the mileage of the line would be in their territory. So they urged a reorganization of the Inter-State. A second Inter-State Telephone Company was incorporated under the laws of the State of Connecticut on March 21, 1881, to carry the building of the line on to New York. Of the four chief officers, three were Connecticut men; the fourth represented Rhode Island. The President was Governor Marshall Jewell of Connecticut; the Vice President was Governor Henry Howard of Rhode Island; the Secretary-Treasurer was Morris F. Tyler of New Haven; and the General Manager was H. P. Frost of New Haven. Meantime consolidation was going on all along the line. In Massachusetts the Telephone Despatch Company was merged with other companies into the New England Telephone and Telegraph Company by November, 1883. In Connecticut, the Southern New England Telephone Company had taken the place of the Connecticut Telephone Company and on October 2, 1882, bought the Inter-State Company and gone on with its work. The changing interests were evident; this might have proved to be an unstable element if the building of the long distance lines had been apportioned out to the local companies.

The Boston-New York Line was completed in due course by 1884, and was formally opened on March 27, 1884. It worked sufficiently well for its real purpose, which was to test out the idea of a long distance telephone system, co-ordinated with but distinct from the local systems. In an official report Thomas B. Doolittle said, "The experimental wires between Boston and New York have fully demonstrated the practicability of

telephonic communication to distant points, and that is all, and all that was expected of them."

Meantime the technical achievements of the engineers, such as Thomas B. Doolittle's hard drawn copper wire and young John J. Carty's metallic circuit, were opening up vistas of telephonic possibility. Envisioning the problem, finding the right man and urging him onward with stimulating support, Theodore N. Vail marshalled the whole work. From Boston to New York! After New York, what?—What not?

He recurred to his original idea, that the construction and operation of these long distance lines must be done by the parent company. It would require what was then considered an enormous amount of money. Application was made to the Massachusetts Legislature to permit an adequate increase of the capitalization of the American Bell for the purpose from $10,000,000 to $30,000,000. It was refused. Therefore there must be a special corporation to do this work under the American Bell. Mr. Vail again turned back to a previous suggestion. He had had the first Inter-State Telephone Company incorporated under the laws of the State of New York. Let the new Company be incorporated in New York.

Now for the right man. In Buffalo, New York, a young man by the name of Edward J. Hall, Jr., had done fine work. In 1884 he was only thirty-one. Mr. Vail himself was not yet forty, and was never dismayed by youth in his men if they had brains and initiative to make up for the lack of years. He sent for Mr. Hall, now living in Elizabeth, New Jersey, to come to Boston to see him. At the end of their talk, he pushed the papers on the table over toward him and said, "Well, there is the problem. Work it out." It was a great combination: Mr. Vail in command for general guidance; and Mr. Hall turned loose on the job as detail man. But they were large details. So Mr. Hall organized the American Telephone and Telegraph Company as a subsidiary of the American Bell Telephone Company to build, maintain and operate long distance

telephone lines, i.e., lines extending between or across the territory of two or more operating telephone companies. Mr. Hall was the General Manager and Mr. Vail the first President.

So on February 28, 1885, the four incorporators, Edward J. Hall, Jr., of Elizabeth, New Jersey; Thomas B. Doolittle of Bridgeport, Connecticut; Joseph P. Davis of New York City; and Amzi S. Dodd of New York City, set their hands and seals to the Certificate of Incorporation of an association to be called the American Telephone and Telegraph Company, and they appeared before Jno. H. Cahill, Notary Public, No. 92, of New York County, and duly executed the same. And the certificate was filed and recorded in the Office of the Secretary of State of the State of New York, at Albany, on March 3, 1885, 9 hr. 40 m. in the morning, as attested by Anson S. Wood, Deputy Secretary of State.

The charter provided for a capitalization of $100,000 which was sufficient for the time being, for the period of organization. The capital was divided into 1,000 shares of the par value of $100 each, held in equal lots of 250 shares each by the four incorporators. In 1888, on May 5th, the first capital increase to $500,000 was voted.

Consider from the standpoint of 1884 and of that frankly experimental little telephone line from Boston to New York, the enormous range of this charter! How extraordinarily specific its geographical appropriations! After a tolerable success over 250 miles, it contemplated lines of 3,000 miles and more. It addressed itself at once to nation-wide telephony.

"The general route of the lines of telegraph * of said association will be from a point or points in the city of New York along all rail roads, bridges, highways and other practicable, suitable and convenient ways or courses,

* The word "telegraph" was until 1877 to all intents and purposes synonymous with "electrical communication," as the telegraph was the only means of electrical communication before the invention and development to a practical point of the telephone. By 1885 the word "telephone" was well established in its present discriminating sense, but in a legal document like this charter conservative judgment considered it advisable to hold to the old word "telegraph," which also closely identified the new telephone lines with the basic Bell patent, No. 174,465, March 7, 1876, in which the telephone is designated as an "improvement in telegraphy."

leading thence to the cities of Albany, Boston, and the intermediate cities, towns and places, also from a point or points in and through the city of New York, and thence through and across the Hudson and East rivers and the bay and harbor of New York, to Jersey City, Long Island City and Brooklyn, and along all rail roads, bridges, highways and other practicable, suitable and convenient ways and courses to the cities of Philadelphia, Baltimore, Washington, Richmond, Charleston, Mobile and New Orleans, and to all intermediate cities, towns and places; and in like manner to the cities of Buffalo, Pittsburgh, Cleveland, Cincinnati, Louisville, Memphis, Indianapolis, Chicago, Saint Louis, Kansas City, Keokuk, Des Moines, Detroit, Milwaukie, Saint Paul, Minneapolis, Omaha, Cheyenne, Denver, Salt Lake City, San Francisco and Portland, and to all intermediate cities, towns and places, and also along all railroads, bridges, highways and other practicable, suitable and convenient ways and courses as may be necessary or proper for the purpose of connecting with each other one or more points in said city of New York, and in each of the cities, towns and places hereinabove specifically or generally designated."

Dealing with large items indeed, it may still be noted that thus far the charter merely provided for work in the tangible future.

Continuing, the charter reached out to include with very specific thoroughness the whole world. At that time to the minds of most people this must have seemed decidedly visionary. Now it is seen to have been simply a matter of necessity, a matter of course.

"And it is further declared and certified that the general route of the lines of this association, in addition to those hereinbefore described or designated, will connect one or more points in each and every city, town or place in the State of New York with one or more points in each and every other city, town or place in said State, and in each and every other of the United States, and in Canada and Mexico, and each and every of said cities, towns and places is to be connected with each and every other city, town or place in said States and Counties, and also by cable and other appropriate means with the rest of the known world as may hereafter become necessary or desirable in conducting the business of this association."

But standing there with Hall, Doolittle, Davis and Dodd by his side, creating a powerful instrument for facilitating the will of the people and developing American civilization, Vail and

his associates of the American Bell Company, did not forget his technical engineers, the successors of Alexander Graham Bell. Confidently depending upon what they would do, with a phrase which, though casual, impresses us with awe, the document sweeps us on to what was then unimaginable,—"also by cable and other appropriate means." Here was latitude for engineering ability! As long as seven years later, at the opening of the New York-Chicago open air line, the Company stated that "the use of cable which was exceedingly detrimental to telephone transmission" had been used as little as possible in that line. Yet here in 1885 this charter, anticipating and even guaranteeing steady advancement in the telephone art, specifies cable as a great means for doing the impossible. This it has become. The charter goes on with a magnificent inclusiveness:

"Also by cable and other appropriate means with the rest of the known world as may hereafter become necessary or desirable."

Permalloy, radio telephony,—what else? Is there anything from which that new little Company with its $100,000 capitalization was excluded? The whole world was opened wide to it as its field. Surely this was a permanent organization, unlimited in any way.

But no. Like the first Boston-New York line, it must prove itself. A definite term is allotted to it. If it can make good on its possibilities, it will be evident within fifty years. So the clause is put in at the end:

"And the period when it shall terminate shall be at the expiration of the term of fifty years from said day."

In effect, to the American Telephone and Telegraph Company with this charter of its creation, Theodore N. Vail said, as he said to E. J. Hall, Jr., "Well, there is the problem. Work it out." His successors have indeed worked it out. The great experiment has been a success. And now its charter has been made perpetual.

WILLIAM CHAUNCY LANGDON

Talking Pictures in Industry and Education

THE adaptation of the talking motion picture to the needs of industry and education is an activity that promises to bring to the public economic and cultural benefits of ever increasing value. Here is a comparatively new vehicle of communication, born in the Bell Telephone Laboratories and brought to maturity in the Western Electric Company, that records and transmits ideas, locale and personalities to this and future generations, with a fidelity to truth and simplicity of operation that have earned it a high place in the history of the art of communication. It is a medium that makes use of all of the well-known devices of the silent motion picture—microscopic, diagrammatic, time lapse, slow motion and realistic photography, and of the sound transmission principles of the telephone, the radio, and the phonograph, combining them all so skillfully into an harmonious whole that the illusion of reality is substantially maintained.

It was to be expected that leaders in industry would quickly recognize the merits of this new instrumentality and would welcome its inclusion in their spheres of activity. A few examples of the use made of talking pictures by industry show the wide range of business problems which it has successfully helped to solve. It has been used for employee training; for sales demonstration; for the introduction of new products to dealers and the public, and in advertising, publicity and public relations work. It has been employed to carry official messages of management to employees, to report conventions, to analyze service practices and in many other important business activities. For the past three years it has been thoroughly tested in hundreds of ways by industry and has fully justified the claims that were made for it.

The GOODYEAR TIRE AND RUBBER COMPANY for a number

of years had followed the practice of bringing their dealers into Akron for meetings lasting several days. The expense involved in these meetings was very high, and this year it was decided to meet with the dealers in their own localities by using talking pictures. A sales training picture, running an hour and a half, entitled, "Every Third Wheel" was produced, taken to one hundred and sixty-nine cities and shown to more than twenty-one thousand dealers and their employees. The attendance at the meetings was almost double what GOODYEAR had anticipated, and it is the opinion of GOODYEAR officials that the use of talking movies increased their sales for 1931. As a result of the success of this picture, GOODYEAR is now planning the production of its second feature picture to be distributed in 1932.

A somewhat similar activity was carried on by CHEVROLET MOTOR CAR COMPANY, Detroit, Michigan. Three sound pictures were produced for dealer and employee training and were distributed and shown to dealers and employees in theatres throughout the country during the morning hours and in hotels equipped with Western Electric Sound Systems. One picture —"The Prospect Within Two Blocks"—which ran for forty minutes was particularly successful. It was shown in fifty-two cities and the results were so satisfactory that CHEVROLET will produce a fourth picture to be shown at their Fall meetings to dealers this year.

A similar use of the talking movie was made by THE PERFECT CIRCLE COMPANY, Hagerstown, Indiana. This concern produced a three-reel picture on the history of THE PERFECT CIRCLE COMPANY, including a complete explanation of the manufacturing processes involved in producing Perfect Circle Piston Rings. This picture was first shown at the annual convention of the National Spare Parts Association, held in Cleveland last November. Since that time it has been shown to dealers and jobbers throughout the country with gratifying results. In spite of the fact that the automotive industry has been hard

hit by the present depression, the Vice President and Director of Sales of this organization reports that the sale of Perfect Circle Piston Rings has increased 52 per cent this year over any previous year. He gives full credit for this increase to the talking picture entitled "The Magic Circle" and, as a result, this organization is now preparing a new forty minute picture which will have its initial showing in November at the National Spare Parts Association Convention.

STUDEBAKER CORPORATION has been a consistent user of the talking movie for the past three years. Two of its recent pictures produced for theatrical distribution, entitled "A Trip to the Clouds" and "Wildflowers," in which the Studebaker musical organization, "The Champions," was presented to the public, have been particularly successful.

DODGE BROTHERS CORPORATION have made use of the talking picture principally at the automobile shows by means of shadow-box arrangements in hotel lobbies and have caused much widespread comment. So pleased were DODGE BROTHERS with the results of their talking picture campaign that they are now producing a ten reel feature subject in Hollywood, which will be shown for the first time at their dealer meetings to be held throughout the United States this Fall.

Another large user of the talking movie is STANDARD OIL COMPANY (OHIO). This company began with the production of a two reel training picture which was distributed throughout the State of Ohio under the Road Show Plan operated by Electrical Research Products, Inc. Forty-nine shows were given in six days' time. STANDARD OIL COMPANY (OHIO) was so well pleased with the results obtained that they immediately contracted for a series of twelve single reel training subjects, one to be released each month during 1931. Up to the present time seven of these pictures have been produced and shown throughout Ohio, and arrangements have been made for six new pictures for the first six months of 1932.

When the UNITED STATES RUBBER COMPANY wished to

reach golf professionals with an intensive campaign, it turned to the talking movie and produced two sound pictures—one entitled "Pros, Players and Profits" and the other entitled—"The Inside Story of the Golf Ball." These pictures have already been shown in fifty cities to leading golf professionals, sporting goods dealers and gold enthusiasts.

An interesting use of the talking movie was made by COCA-COLA COMPANY. This company produced several pictures, the most important of which was a four-reel subject, entitled "The Soda Fountain Service." This picture contained one of the largest sets ever used in the production of an industrial picture. A complete drug store was installed in the studio and placed in actual operation in all its details in order to give the picture a high degree of accuracy. The objective of the picture was the analysis of service and the presentation of methods for improvement.

Several other companies have been actively engaged in talking movie campaigns this year. Outstanding among these are the PUGET SOUND LIGHT & POWER COMPANY with their excellent production picturing the State of Washington; STANDARD BRANDS, INC. with an eight reel feature subject, entitled "Food For Thought"; RICHFIELD OIL COMPANY with their three reel subject featuring Lloyd Hamilton, entitled "Service Wins Again"; INTERNATIONAL HARVESTER COMPANY with a feature length subject commemorating the one hundredth anniversary of the invention of the McCormick Reaper and Harvester; ARMSTRONG CORK COMPANY with a picture describing their new product "Temlock," which was taken out to lumber dealers throughout the country, and many others.

Another development that will be of economic importance in this time of depression, and which is well under way, is worthy of comment. Many of the largest corporations in the country are completing their plans for an intensive use of talking movies for the furtherance of better personnel relations, more economical training of employees and the improvement of public re-

lations. An example of this work is the excellent start that has been made by the AMERICAN TELEPHONE AND TELEGRAPH COMPANY through the production of pictures for the training of directory advertising salesmen, the training of plant construction forces in the use of the new mortar bandage joints, and a picture showing the advantages of systematic training of P.B.X. operators.

The list of concerns using talking pictures is an imposing one for a year of depression and the results that industry has secured through these activities give a clear indication of the great value that the talking picture has in the commercial world.

Satisfactory as these results have been in the field of industry, perhaps even more striking have been the results secured by Electrical Research Products, Inc. in adapting the talking motion picture to education.

In the initial stages of this development, a small number of demonstration pictures were produced and shown at the principal educational conventions of the National Education Association, Progressive Education Association, Parent-Teacher Associations and many State Teacher Associations. Literally thousands of opinions and suggestions were sought for and secured from teachers and school administrators as to the value and proper use of talking movies in the schools, before the broad outlines of the educational plan were finally laid out.

In one of the early campaigns a twenty minute demonstration picture was shown at the summer training courses for teachers at eleven universities, including Chicago University, Columbia University, University of Southern California and other important institutions. Fifty-six demonstrations were given to nearly seven thousand students, faculty members and college officials, and by means of questionnaires some indication of the trend of educational thought was secured. The opinion was almost unanimous that the talking movie would be of tremendous value in educational work. These seven thousand

educators listed their reasons for believing in the talking movie, and it is interesting to reproduce them here in the order of importance in which they were rated on the questionnaires. These educators thought:

1. The talking movie makes the subject more stimulating and interesting.
2. Gives information not available in the classroom.
3. Excels in revealing personalities.
4. Democratizes education.
5. Leaves a more lasting impression.

An Educational Advisory Committee was formed, consisting of several prominent educators, representing different activities in the educational field. For three years these advisers have been in constant consultation with the administrators of the educational plan. They have formulated educational standards to serve as guides in the production of talking movies for classroom use. As the plan evolves, they are determining from the standpoint of the teacher himself the subject to produce, with a careful scrutiny of their content, so that the greatest possible advantage may be taken of the talking movie as an agency for the enrichment of the school curriculum.

With the advice and assistance of this Educational Advisory Committee, three specialized groups were formed to carry out the broad plans of the Department of Educational Talking Pictures of Electrical Research Products, Inc. for the introduction of the talking movie as a teaching aid. These groups are the Research, Production and Promotion Divisions of the Educational Department.

The Research group, supervised by a former Superintendent of Schools, with graduate work at Chicago and Columbia Universities, was organized with several research associates, each one of whom is a specialist in the field of education. Each has had actual teaching experience and each holds the Ph.D. degree in educational research in his special field. This full time

research staff has made a complete survey of the courses of instruction offered in American schools; has analyzed the sales possibilities and has determined in what way talking pictures can be employed to make the greatest possible contribution to American education. On the basis of these analyses, checked with educators throughout the country so that group judgment rather than personal judgment would prevail, a series of complete teaching courses, into which the talking movie has been incorporated, has been prepared. In each of these courses, units of instruction have been prepared. Teachers' Handbooks have been made available and suggested continuities have been written on the basis of which demonstration pictures have been made for release to the teaching profession.

The Production Division was organized with several experienced directors, scenario writers and technicians, each of whom has had several years training in the production of pictures for the non-theatrical market. Supplementing the work of this division and of great value in maintaining the quality of the pictures produced have been the services of the engineers, the technical experts on sound recording, sound reproduction, and acoustics, who are part of the headquarters staff of Electrical Research Products, Inc.

Using the material developed as a result of the research activities and with the advice and assistance of outside specialists in the educational field retained for consultation in the case of each production, the Educational Department produced some fifty educational talking movies for demonstration uses in the school field in the following departments of education: Teacher Training; Music Appreciation; Natural Science; Physical Education; Social Science.

Among the pictures produced are those featuring some of the most famous educators in the world, recognized leaders whose standing and reputation permit them to speak with authority on the subjects in which they have specialized. A few of these authorities are: Dr. William H. Kilpatrick, Columbia Univer-

sity; Dr. Guy T. Buswell, University of Chicago; Dr. Boyd H. Bode, Ohio State University; Dr. Arnold Gesell, Yale University; Dr. Charlotte Buehler, University of Vienna; Dr. Hughes Mearns, New York University; Dr. Richard D. Allen, Lecturer at Harvard University; Dr. Arthur I. Gates, Columbia University; Dr. Clyde Fisher, American Museum of Natural History, and others.

During the past year demonstration pictures produced under the educational plan have had a widespread showing throughout the country and a large number of interesting uses have been made of the material prepared and of the equipment provided for such use.

One activity which is of special interest is the Parent and Teacher Guidance course which was conducted weekly at the Mayflower Hotel, Washington, D. C., February 24 to April 15, 1931. This course, which was sponsored by Dr. William J. Cooper, Commissioner of Education, and by an imposing list of leaders in the educational world, used one of the teacher training pictures at each session as the basis for discussion. The course of instruction was taken by six hundred educators, teachers and parents. The discussions were spirited and prolonged and the results were approved as making a significant contribution to American education.

A similar course of instruction in visual education was given at the University of California, Los Angeles, during the month of July, in which a large number of educational pictures were used as the basis for the course. These two examples of the use of the talking movies in teacher training have been referred to generally in the press as "The Talking Movie University," and great good has been accomplished.

While these two courses show an interesting use of the talking movie, more important still has been the fact that, not only in teacher training courses, but also in actual classroom situations, the talking movie has been used during the past year to reach thousands of students as a regular part of their every

day courses of instruction. With the opening of the present school term it is expected that a still wider use will be made of talking movies on the sound projectors that have been recently installed in several of the school systems throughout the country.

It may be well to note that schools may use the subjects prepared for them with the greatest assurance that a substantial contribution to the learning process will result. During the past year a staff of research workers, experienced in psychological testing and statistical analysis, has made a series of tests and measurements to determine the value of the talking movie in comparison with other teaching devices. The findings will shortly be published in monograph form for the professional field and will reveal for the first time well authenticated conclusions that the contribution of the talking motion picture to the learning process is definite and substantial.

Many related activities have been carried on in the non-theatrical use of talking movies, all of which are charged with interest, but do not fall within the scope of this present article. One of these is the production of medical pictures for clinical instruction, nurses' training and for use at medical societies throughout the country. Several remarkable pictures have been produced in this field and have been widely used with uniformly good results.

Demonstration pictures have also been produced for use in the religious field and several of the most important denominations are now carrying on research programs to determine in what way the talking motion picture can best be adapted to advance the work of the church. Sufficient results have already been secured in the training of Sunday School teachers, in the recording of outstanding messages and personalities, and in the production of religious music to indicate a widespread use of the medium for this purpose in the near future.

At many of the Veterans' Hospitals throughout the country, talkies shown on Western Electric equipment are bringing

comfort and cheer to disabled soldiers and sailors. Ships at sea are showing regular programs. County and state institutions are bringing to their inmates a conception of the changing world outside. Teachers are gaining a new perspective and new enthusiasms for their calling. Doctors are studying the techniques of famous surgeons. School children are gaining their early concepts through carefully formulated talking movie lessons. Surely, here is a Bell System contribution to American civilization of growing importance, and one that is in harmony with the high ideals of service to the public that is the heritage of telephone men and women everywhere.

F. L. DEVEREUX

Notes on Recent Occurrences

OVERSEAS TELEPHONE SERVICE EXTENDED

Radio telephone service was extended on August 15 from North America to the Canary Islands, off the west coast of Africa, slightly south of Morocco.

A call from New York to any point in the Canary Islands costs $40.50 for the first three minutes of conversation and $13.50 for each additional minute. After leaping the Atlantic by radio, calls cross England by land wire, pass under the English Channel and travel to Madrid by wire. Here they are transmitted by radio to their destination in the Canary Islands. This last operation is handled by the National Telephone Company of Spain while transmission from the United States is in the hands of the American Telephone and Telegraph Company.

600,000 A. T. & T. STOCKHOLDERS RECEIVED JULY 15 DIVIDEND

THE dividend of July 15 to American Telephone and Telegraph Company stockholders of record June 20 was paid to more than 600,000 owners of the stock. This is the largest number ever to receive a dividend payment from the Company.

From the beginning of the year to the record date the A. T. & T. stock list increased over 33,000. About 15,000 of the net gain was accounted for by employee stockholders while about 4,000 new accounts resulted from installment subscriptions completed last April under the 1930 stock offer.

As has been true in the past, small stockholders comprised the bulk of the gain, those holding 5 shares or less increasing 16,000 and those owning 25 shares or less about 30,000. From December 31, 1930 to June 20, 1931 the average number of shares per holder declined from 31.6 to 30.8.

Since the end of last year stockholders have increased in all geographical areas of the United States with the Central and Southwestern territories showing the largest percentage gains.

CONFERENCE OF BELL SYSTEM PRESIDENTS

A CONFERENCE of Presidents of Bell System Companies was held from September 29 to October 4, inclusive, at Yama Farms, Napanoch, New York.